

Follow-up Review of the 1996 Integrated Safety Management Evaluation at the Fernald Environmental Management Project

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Office of Environment, Safety and Health

Executive Summary

The Department of Energy (DOE) Office of Oversight conducted a follow-up review of the 1996 independent oversight evaluation of environment, safety and health programs at the Fernald Environmental Management Project (FEMP) from September 14 to 23, 1998. The review was conducted to determine the status of corrective actions taken to address selected issues and concerns identified during the 1996 integrated safety management evaluation. The areas reviewed included: definition and implementation of roles and responsibilities for DOE personnel; programs for assessing performance and implementing corrective actions; work planning and control; maintenance; electrical safety; and radiation protection. Both DOE and Fluor Daniel Fernald, Inc. (FDF) were evaluated during the review. The review included interviews with individuals having responsibility for areas being assessed, documentation reviews, area walkdowns, and observation of work activities at various facilities and locations throughout FEMP.

Results

The DOE/Fernald Environmental Management Project Office (DOE/FEMP) has improved its effectiveness in overseeing contractor activities at FEMP. DOE/FEMP clarified roles and responsibilities of site office personnel and established a comprehensive approach for DOE line management assessment activities. DOE/FEMP personnel understand these roles and responsibilities and are implementing them in a good teaming relationship with the DOE Ohio Field Office (OH). As a result, DOE can proactively influence contractor performance through mechanisms such as critical review of proposed FDF corrective actions to address DOE/FEMP assessments and contract performance measures. Additional benefit would be gained from formalizing DOE/FEMP processes for tracking and trending, transmitting findings, reviewing and approving FDF corrective action plans, and verifying and validating corrective actions.

FDF work planning and control processes are much improved and provide the tools for applying the five core functions of integrated safety

management. The enhanced work planning initiative has been a key driver for these improvements; it has significantly reduced the number of different work control processes being used across the site, and further consolidation is planned. Management is committed to implementing integrated safety management at the working level and maintaining a safe working environment. A review of several recent events, however, does indicate that integrated safety management is not yet adequately implemented at the working level. One specific event involved criticality safety violations in the nuclear materials disposition project due to inadequate planning, insufficient controls in place, procedure adherence problems, poor shift turnovers, and lack of management ownership. There are other events that indicate problems with control of subcontractors.

During the 1996 Office of Oversight evaluation, the maintenance program was found to have significant programmatic and implementation weaknesses. The results of the follow-up review indicate a marked improvement in the maintenance program, and no significant deficiencies were noted. In particular, the automated work planning system is a very effective tool that has contributed to a significant reduction in the site maintenance backlog. Centralizing the maintenance organization within one project and one location has also contributed to improved maintenance activities. Because many of the program elements for maintenance have been recently established, implementation still needs to be proven effective.

Improvements are also evident in resolving electrical safety weaknesses identified in 1996. Improved preventive maintenance on the main and unit substations has resulted in improved reliability of the site's power distribution system. FDF has promoted training on electrical safety and has a good electrical safety record. Emphasis by DOE/FEMP on electrical safety during assessments has also helped to improve awareness. However, additional clarification of roles and responsibilities for DOE and FDF subject matter experts is needed with respect to electrical safety requirements. Some elements of the electrical safety program also need to be reviewed to determine whether improvements

could be made based on new DOE guidance in this area.

The occupational radiation protection program was found to be an effective program during the 1996 Office of Oversight evaluation. This follow-up review indicates that while program documentation associated with the radiation protection program is comprehensive and establishes a strong technical basis, improvements are required in implementation. There has been much better integration of the as-low-as-reasonably-achievable (ALARA) process in sitewide projects (this was the only weakness identified in 1996). Management and technical staff responsible for the radiation protection program continue to maintain a high level of qualification and competence. Weaknesses in conduct of radiological operations were evident, however, during observed work activities. This resulted from inattention to detail and lack of rigor in adhering to radiological control requirements. Radiation work permit documentation was also found to need improvement to clearly and consistently identify radiological controls in all work situations.

Many improvements in the FDF assessment program are recent, and while they show an increased commitment to feedback and improvement, they have not yet demonstrated overall effectiveness. Line management self-assessment activities, in particular, need to be improved to include an increased emphasis on the performance of personnel conducting work activities. While improvements in some elements of the FDF corrective action process are evident, continued attention and diligence are required to reduce the number of repeat occurrences. FDF is effectively utilizing performance indicators in several areas to

improve and monitor performance. Additional formalization of the FDF lessons-learned program would ensure effective dissemination to personnel needing the information.

Conclusions

During the 1996 Office of Oversight evaluation, safety management at FEMP was found to be effective, with some systemic issues requiring increased attention. This follow-up review noted significant improvements in addressing the systemic issues identified in 1996, demonstrating a management commitment by both DOE/FEMP and FDF to continuous improvement. The emphasis on continuous improvement was also evident throughout the follow-up review based on the responsiveness of the site, and actions are already under way on identified opportunities for improvement.

DOE and FDF have maintained the site as a safe place to work, with a good safety record. There is also a very positive relationship between site management (DOE and FDF) and stakeholders, such as union representatives and local citizen groups. While some improvements still need to be made, the site is clearly improving and having success in establishing effective processes at the working level for implementing the five core functions of integrated safety management. Additional emphasis is required on implementation of integrated safety management through disciplined operations. Continued emphasis is also required in assessment and corrective action programs to ensure that systemic issues that adversely affect performance are identified and corrected in a timely manner.

In addition to evaluating overall integrated safety management systems at Department of Energy (DOE) sites, the Office of Oversight is committed to ensuring that issues or concerns identified during previous evaluations and accident investigations are brought to a satisfactory resolution in a timely manner. To fulfill this commitment, the Office of Oversight conducts follow-up reviews to monitor progress in implementing improvements on both a complex-wide and site-specific basis. As part of this process, an onsite review was conducted at the Fernald Environmental Management Project (FEMP) during the period September 14-23, 1998, to follow up on issues from the 1996 independent oversight evaluation of environment, safety and health programs.

FEMP is located on a 1,050 acre site in southwestern Ohio, approximately 17 miles northwest of Cincinnati near the communities of Miamitown and Ross. The site is owned by DOE and operated by Fluor Daniel Fernald, Inc. (FDF). The site was formerly known as the Feed Materials Production Center because of its mission to provide highly purified uranium metal products to “feed” DOE production reactors in order to make plutonium and tritium. Production was suspended in July 1989 and formally ended in 1991. FEMP’s current mission is to remove or dispose of all site nuclear materials, carry out decontamination and decommissioning of all buildings and facilities, and return as much of the site as possible to public use.



FDF, the prime contractor, is in the first year of a three-year option to the original five-year performance-based contract at FEMP. The contract was recently extended to cover the maximum eight-year period. FDF has a core group of employees at FEMP but subcontracts a considerable amount of decontamination and decommissioning work to a number of other companies. The DOE Fernald Environmental Management Project Office (DOE/FEMP) is responsible for ensuring that the FEMP integrated safety management program is implemented under DOE Policy 450.4, “Safety Management System.” Also providing line management direction and oversight are the DOE Ohio Field Office (OH) and the Office of Environmental Management at Headquarters. Approximately 2,000 persons work at FEMP.

The follow-up review primarily focused on corrective actions and progress to address previously identified performance issues and concerns. Lines of inquiry for this assessment corresponded to specific issues and concerns raised during the 1996 Office of Oversight integrated safety management evaluation in the following selected areas:

- Definition and implementation of roles and responsibilities for DOE personnel
- Programs for assessing performance and implementing corrective actions
- Work planning and control/maintenance
- Electrical safety
- Occupational radiation protection.

The review included interviews with DOE and FDF management, supervisors, and workers; documentation reviews; area walkdowns; and observation of work activities. Work activities were observed at various facilities and locations throughout FEMP based on in-progress work during the team’s visit. Positive attributes, weaknesses, and an overall assessment of each follow-up area are provided in the Results section of this report.

2.1 Definition and Implementation of Roles and Responsibilities for DOE Personnel

Background

The 1996 Office of Oversight evaluation identified confusion between OH and DOE/FEMP regarding organizational roles and responsibilities in a number of areas. There was also significant confusion within DOE/FEMP regarding management expectations for the implementation of the Technical Management Plan (TMP), particularly with respect to compliance assurance. The TMP is a document that identifies responsibilities and tasks of DOE personnel in the technical management of FDF.

Assessment

Since 1996, there has been progress in clarifying roles and responsibilities within both the OH and DOE/FEMP offices. OH has developed several documents to identify safety management responsibilities, assigned roles, authorities, and functions. During the 1998 Office of Oversight integrated safety management evaluation at the Mound Environmental Management Project, another OH site, some ambiguities were still identified with these documents. Another evaluation of the effectiveness of these documents was deferred until OH has a chance to put corrective actions in place. Discussions with DOE/FEMP management indicate that the roles played by the OH staff in the conduct of assessments are better understood and implemented.

DOE/FEMP's response to deficiencies identified in 1996 included reorganizing the Office of Safety and Assessment and revising the TMP. DOE/FEMP management has defined the roles of the three groups within the Office of Safety and Assessment responsible for contractor monitoring, assessment, and independent oversight, and the Quality Assurance Program Description has been

incorporated into the body of the TMP. The TMP also contains specific requirements for the selection and scheduling of DOE assessments for each fiscal year on a master assessment schedule.

While the TMP has been significantly improved, some aspects of the assessment program need to be better defined so that the TMP accurately reflects all current practices. Implementing procedures are lacking for reviewing, approving, and closing FDF corrective actions and tracking and trending of FDF deficiencies (see Section 2.2 for further information). Additionally, the TMP does not adequately identify the individuals responsible for ensuring that all corrective actions are properly closed. On balance, however, the TMP is effective in defining roles and responsibilities of DOE/FEMP personnel.

Positive Attributes

The TMP is an effective tool for facilitating implementation of the DOE/FEMP assessment program. The DOE/FEMP organizational structure and associated responsibilities for monitoring and assessing FDF performance are, with few exceptions, clear.

DOE/FEMP personnel have a good understanding of their roles and responsibilities. Staff within the DOE/FEMP Office of Safety and Assessment demonstrated a uniform understanding of their assessment-related roles and responsibilities defined in the TMP.

Weaknesses

None identified.

Summary

Corrective actions taken as a result of the 1996 Office of Oversight evaluation have been effective in clarifying OH and DOE/FEMP roles and responsibilities; these actions have resulted in better coordination between the two offices. Although some improvements are necessary, the TMP effectively defines roles and responsibilities of DOE/FEMP personnel. Additionally, DOE/FEMP personnel understand their functions and are, for the most part, effectively implementing them.

2.2 DOE and FDF Programs for Assessing Performance and Implementing Corrective Actions

Background

The 1996 Office of Oversight evaluation identified that the DOE/FEMP assessment program suffered from a number of deficiencies, many due to non-compliance with the provisions of the TMP and associated implementing procedures. The effectiveness of the assessments performed by DOE/FEMP varied considerably, and DOE/FEMP had not developed an integrated, comprehensive approach to assessing environment, safety, and health performance.

The frequency, formality, and rigor of FDF assessment programs in 1996 were also found to be mixed. Problems resulted from a lack of consistent guidance documents, insufficiently trained staff to perform root cause analysis, and inadequate verification and validation of corrective actions. Weaknesses in the structure and implementation of the corrective action programs inhibited the timely and effective resolution of program and performance deficiencies and the prevention of recurrence. Corrective actions and root cause analyses for FDF deficiencies lacked focus, did not meet procedural requirements, and were often inadequate. Finally, FDF's lessons-learned program was immature.

Assessment

DOE/FEMP Assessment Programs

Since 1996, assessment performance by DOE/FEMP has been strengthened by the creation of the Project Assessment group, which has overall responsibility for implementing the assessment program. The Project Assessment group team leader serves as facilitator for developing the master assessment schedule, which is used to avoid duplication of effort among the various organizations performing self-assessments of DOE/FEMP and assessments of FDF activities. A review of DOE/FEMP assessments indicates that they are generally effective in identifying both activity-specific and programmatic deficiencies in FDF programs and facilities. In addition, DOE/FEMP is making effective use of contractual performance measures to hold FDF accountable for implementing effective assessment and corrective action programs. DOE/FEMP has used the combination of assessments and contract performance

measures effectively to proactively influence FDF performance.

Although DOE/FEMP's assessment process is institutionalized through implementing procedures, there are still weaknesses in several key areas. DOE/FEMP lacks a formalized process for reviewing, approving, and closing FDF corrective actions submitted in response to identified concerns and findings. The evaluation of FDF corrective actions against a consistent standard would promote the development of corrective actions of more uniform quality. DOE/FEMP also lacks a current implementing procedure for conducting formal tracking and trending of FDF deficiencies. Analysis of FDF performance trends is being conducted ad hoc, without full consideration of all available information.

DOE/FEMP implementing procedures for walk-through assessments provides only very general guidance on expectations for documentation of deficiencies and communication of issues to FDF. As a result, deficiencies identified during DOE/FEMP walk-throughs are transmitted to multiple FDF personnel through a variety of communication channels. As a result, there is often confusion among FDF line management and staff over responsibility for action and expectations for correction. Additional clarification and formalization of this procedure are necessary.

Finally, although several DOE/FEMP self-assessments have recently been performed, the process is not formally implemented. The DOE/FEMP self-assessment program is not specifically incorporated into the TMP, nor are the self-assessments included on a master self-assessment schedule. DOE/FEMP is cognizant of this need for improvement.

FDF Assessment Programs

Since 1996, FDF has implemented a number of significant improvements to provide a programmatic framework for an effective assessment program. FDF developed a hierarchy of assessment activities that is supported by numerous new or improved sitewide implementing procedures. Other significant improvements include specifically tasking the Quality Assurance Department Manager with the responsibility; providing additional resources for improving the effectiveness of the FDF assessment and corrective action programs; and implementing systems to record, track, trend, and analyze deficiencies at the concern, finding, and field observation level.

FDF has instituted a number of organizational changes to improve the assessment process. A "core audit team" was recently established as the independent assessment arm of the Quality Assurance Department. The team is identifying a complete list of programmatic audit requirements for inclusion on the FDF master integrated assessment schedule. The Quality

Assurance Department is also providing mentoring to line managers and staff to improve project and work activity self-assessments.

While FDF has established an organizational structure and programmatic framework that has the potential to greatly improve the quality of assessments, these changes are recent, and their effectiveness has not yet been proven. A sample of formal audits and surveillances indicates a range of assessment rigor. Additionally, a review of selected assessment schedules and self-assessments indicates that many assessments are focused at a level not conducive to overall performance improvement. Examples include self-assessments of project work that consist of housekeeping checklists rather than performance-based evaluation of work activities and an orientation towards verification of corrective action closure. Reviews of line management self-assessments also indicated inconsistent compliance with implementing procedures for performing the assessments.

The Independent Safety Review Committee is much improved since 1996. The committee meets monthly, publishes minutes of ongoing reviews of nuclear safety-related documents and program elements, performs specialized assessments, and has been actively involved in reviewing recent nuclear safety-related incidents. FDF has also realigned the membership of the committee to promote greater independence and bring an outside perspective at a senior management level.



FDF Lessons-Learned Program

Substantial improvements were noted in the FDF lessons-learned program. Lessons-learned information from both onsite and offsite events and selected assessment findings is entered into a computerized data base. This data base is linked with the electronic mail system, and divisional lessons-learned coordinators are automatically notified of data base entries. The coordinators are responsible for disseminating the information to the appropriate individuals and reporting their actions back to the lessons-learned program leader.

Although the process for disseminating information appears to work well, the feedback element of the lessons-learned program is an area of weakness. Divisional lessons-learned coordinators do not consistently return a timely response to the program leader, as required. An institutional mechanism for periodically verifying that workers understand lessons-learned information and are applying it to improve performance is also not evident. Unless the accountability mechanisms within the feedback process are strengthened, FDF management cannot be assured that the individuals needing lessons-learned information at the work activity level are receiving, understanding, and utilizing the information.

DOE/FEMP and FDF Corrective Action Programs

Both DOE/FEMP and FDF have taken a number of steps to improve the corrective action process. One of the most significant steps has been DOE/FEMP's emphasis on FDF's development and implementation of corrective actions that address underlying systemic issues rather than symptoms. This step has resulted in FDF corrective actions that appear to be improving the quality of FDF operations.

FDF has made significant improvements in root cause analysis and corrective action development processes. FDF has formed an experienced root cause core team that conducts a formal root cause investigation and determination in accordance with site-specific methodology for the most significant events. For other important events and non-conformances, the cognizant project is responsible for forming an ad hoc team to determine the root cause. Consequently, a large number of FDF personnel have been trained in the site's root cause methodology, and these teams are usually supplemented with a member of the root cause core team.



While DOE/FEMP and FDF management believe that the FDF corrective actions continue to improve and that they are more likely to prevent event or deficiency recurrence, some recent events indicate that

continued management attention is needed. For example, the similarities between the precursor to the July 1997 suspension of all operations associated with enriched nuclear material and the July 1998 nuclear criticality safety violations in the nuclear material disposition project indicate that the initial corrective actions were inadequate and that the assessment program could not provide the information that management needed to prevent event recurrence.

Performance Indicators

FDF has made significant progress since 1996 in making effective use of performance indicators to improve site performance. In the quality assurance area, divisional and sitewide performance, as measured by such parameters as the number of non-conformance reports and the number of non-conformances closed on time, is reported monthly to senior management. In the FDF radiological controls program, a number of radiological performance measures are tracked and trended, such as individual and collective radiation dose, contamination events, and radiological deficiency reports.

Positive Attributes

DOE is effectively utilizing contract performance measures to encourage effective safety performance. Contract performance measures are being used to help drive improvements in implementing integrated safety management at the working level. DOE/FEMP and FDF are also using periodic meetings to discuss the status of these performance measures as a forum to discuss specific measures to improve site performance.

DOE is effectively monitoring FDF performance to accomplish its line management oversight responsibility. DOE/FEMP has a well coordinated assessment program that involves active participation by Facility Representatives, subject matter experts, and project managers. The DOE/FEMP oversight strategy includes periodic programmatic assessments, walk-throughs, and special assessments.

Improvements in some elements of the FDF corrective action process are evident. Implementation of the root cause analysis core team concept and the significant effort expended in training project personnel in the site's root cause methodology are forming the foundation for the development and implementation of improved corrective actions.

FDF is effectively utilizing performance indicators for safety management. Performance indicators have been developed and are being tracked and trended in a number of areas. Performance

indicators reviewed for quality assurance, maintenance, and radiation protection are having a positive impact in focusing FDF on safety management performance.

Weaknesses

DOE processes for tracking and trending, transmitting findings, reviewing and approving FDF corrective action plans, and verifying and validating corrective actions are not formalized. The informality of processes in these areas is inhibiting the effectiveness of DOE/FEMP's efforts to improve FDF's performance.

FDF line management self-assessments need a greater emphasis on evaluating performance at the working level. Some self-assessments are not focused at a level that will identify areas to improve performance of work activities. While substantial improvements have been made, management attention continues to be needed to ensure that the activities selected for assessment are best suited to improving organizational performance and that the personnel performing the self-assessments are properly trained.

There is no mechanism for ensuring that all lessons learned are consistently received and effectively utilized by FDF and subcontractor personnel who would benefit from this information. Although the site uses a variety of communication channels to disseminate lessons-learned information to the workforce, the current process does not provide assurance that all of the information is consistently received in a timely manner by the intended audience and that it is improving workforce performance.

Summary

Significant improvements are evident in both the DOE/FEMP and FDF programs for assessing performance and implementing corrective actions. Through a number of mechanisms, such as contract performance measures and a rigorous oversight program, DOE/FEMP is having a positive impact on FDF performance. FDF has responded to DOE/FEMP's efforts with a series of substantive sitewide improvement initiatives directed at providing an institutional framework for improving various aspects of their long-term performance, including prevention of events and recurrences. While the DOE/FEMP assessment program is considered to be effective, formalization of several processes would be of benefit.

Many elements of the FDF assessment and corrective action program are new and are not yet proven to be effective. However, the number of improvements since the 1996 Office of Oversight evaluation indicates that good progress is being made.

Specific progress was noted in the use of performance indicators and some aspects of corrective actions. Continued management attention is needed to ensure that corrective actions address systemic issues and are fully implemented. A greater emphasis on assessing the performance of personnel conducting work activities is also needed.



2.3 Work Planning and Control/ Maintenance

Background

The 1996 Office of Oversight evaluation identified significant programmatic and performance deficiencies in the maintenance and work control areas. Maintenance program plans, policies, and procedures were not issued or revised in a timely manner to properly support maintenance activities. The Maintenance Department was not performing and documenting maintenance activities, such as calibration, post-maintenance testing, procedure reviews, and tracking and trending, as required. The 1996 assessment also identified numerous deficiencies in maintenance work packages that resulted from failures to follow procedures. Maintenance Department corrective actions were not timely, were not adequately tracked and trended, and failed to identify root causes and establish effective recurrence controls. The enhanced work planning initiative had just started.

Assessment

Enhanced Work Planning

The enhanced work planning initiative has been effective in greatly improving site work control processes that will assist in applying the five core functions of integrated safety management. The Enhanced Work Planning Department, with dedicated personnel, assists core teams from each department

and project in developing baseline work control practices and implementing enhancements. As a result, significant improvements in the Maintenance Department and other departments were evident in new or revised formalized work control systems. The core teams are chaired by line management from the respective departments/projects and are composed of Enhanced Work Planning Department mentors, workers, and representatives from disciplines involved in the work. A formal prioritized implementing schedule with detailed milestones has been established and approved. The enhanced work planning initiative was found to be strong and well established. Although implementation of integrated safety management needs additional emphasis, progress in establishing the tools for applying the five core functions was evident, positive, and measurable.

Work Planning and Control

Since 1996, FDF has reorganized along project lines. The reorganization and application of the enhanced work planning process, discussed above, has reduced the number of work control processes from about 28 to six. The reduction in fragmentation has improved efficiency and consistency, and has reduced the span of control for safety personnel and managers. However, the recent event involving a criticality safety violation at the nuclear material disposition project is an indication that integrated safety management has not yet been adequately implemented at the work activity level. Although there was no violation of the double contingency principle or consequence to the safety and health of the workers, the public, or the environment, there was a definite breakdown in work planning and control. A comprehensive evaluation by FDF indicated a variety of problems, including inadequate planning, insufficient controls, procedure adherence problems, poor turnovers, and lack of management ownership.

At the time of the 1996 Office of Oversight evaluation, major work activities were split between FDF and primarily one subcontractor, Babcock and Wilcox. FDF maintained the site and performed safe shutdown activities, and Babcock and Wilcox performed decontamination and decommissioning of Plant 1 and Plant 4. FDF still maintains the site and performs safe shutdown activities; however, a number of different subcontractors are now performing decontamination and decommissioning and other work activities. The increase in the number of subcontractors under several different projects has contributed to recent subcontractor events relating to inadequate work planning and control. Although the root causes and responsible subcontractors vary, it is evident that new subcontractors lack an understanding of DOE work and safety requirements.

The enhanced work planning initiative established a worker qualification program core team to address construction subcontractor qualification issues. For subcontractors, the core team identified several enhancements to improve performance. These enhancements, which have not yet been implemented, include assignment of subcontractor training coordinators, developing performance indicators, improving site entrance and exiting procedures, and improving communication of site requirements to subcontractor management and workers. These enhanced work planning measures, when implemented, should improve safety and correct weaknesses in subcontractor performance.

Three subcontractor events related to facility penetration in December 1997 resulted in a small task group being formed to develop a penetration permit procedure to supplement existing guidance. The February 19, 1998, revision to the procedure significantly improved the site's penetration permitting process. However, review of this procedure indicates continuing deficiencies and areas for improvement. The procedure allows 1-1/4 inch penetration into floors, ceilings, and walls of all compositions without additional guidance, cautions, or checks for outlet boxes, switches, fixtures, and power panels that could easily be within 1-1/4 inches of the surface. Review of a recent event where workers penetrated an energized 240-volt line while drilling a 1-1/4 inch penetration indicates that corrective actions were inadequate. In addition, a review of several penetration permits indicated inconsistencies in completing penetration permits.

Maintenance

The major weaknesses identified in the maintenance area in 1996 have been addressed, and significant improvements are evident. The FDF reorganization along project lines and the centralization of maintenance functions, including appointment of a single maintenance manager, improved maintenance communication and coordination. Approved organization charts clearly depict the maintenance organization, and the responsibilities for important maintenance department positions are documented. Active participation in the enhanced work planning initiative, including the workforce, has greatly improved the maintenance department's work planning and control processes. Because many of the programs are new and some deficiencies were identified, implementation still needs to be proven effective.

A Maintenance Implementation Plan based on requirements of DOE Order 4330.4B, "Maintenance Management Program," and consistent with the FDF management plan and maintenance standards and requirements identification document is implemented. Requirements flowdown is improved and forms the

basis for a number of formally implemented elements that were not present in 1996. Elements developed and implemented included:

- The Automated Work Planning system for maintenance alterations, fabrication, corrective maintenance, preventive maintenance, and job tickets (small jobs)
- A sitewide measuring and test equipment program and central shop
- A formal maintenance self-assessment program
- Formal performance indicators that are routinely used for tracking and trending
- Creation of an annual work plan
- Formalized and documented work planning
- A formalized lessons learned and required reading program
- A central hoisting and rigging shop
- An increased number of planner estimators and maintenance coordinators.

Since 1996, 19,000 preventive and 900 corrective maintenance work orders have been eliminated on inactive equipment to focus resources on active and needed equipment. As a result, the maintenance backlog has been reduced to two weeks.

A review of maintenance work orders, small job tickets, and selected walkdowns indicated that maintenance programs are generally implemented as required. Because of the large number of new maintenance program elements and procedures, implementation is still evolving. A review of approximately 40 small job tickets and 20 work packages indicated a few minor deficiencies and inconsistencies. Maintenance Department self-assessments are also identifying some implementation deficiencies. These assessments, however, need more emphasis on performance and activities.

Interviews with three maintenance planner/schedulers and the planner/scheduler supervisor indicated that they were familiar with jobs under their control and the personnel working those jobs. The individuals were also knowledgeable of work control procedures, prioritization, backlogs, material hold, and other detail. Average times for job planning, scheduling, and completion had been measurably reduced due to automation of the work control process, and by adding additional planners and maintenance coordinators.

Selected walkdowns of in-progress maintenance activities identified no significant deficiencies, although several minor problems were noted with the Building 30/45 fire protection and alarm panel battery bank. Overall, the Maintenance Department reportable event history is good, with only two reportable events in the past year. The Maintenance Department's safety culture, attitudes, professionalism, and management/labor relations have also been strengthened.

Positive Attributes

The enhanced work planning initiative is well conceived and established and has resulted in measurable improvements in work control processes at FEMP. A dedicated Enhanced Work Planning Department, detailed implementing schedules and milestones, and establishment of core teams chaired by the line organizations with worker involvement resulted in significant work planning process improvements.

There has been significant improvement in all areas of the Maintenance Department. Improvements included implementation of a Maintenance Implementation Plan, an annual maintenance plan, the Automated Work Planning System, a centralized measuring and test equipment process, formal planning and scheduling, maintenance and scheduling performance indicators, a self-assessment program, a lessons-learned program, and a centralized hoisting and rigging shop.

The Maintenance Department has substantially reduced corrective and preventive maintenance backlogs and has decreased job planning time and delays in job completion. Preventive and corrective maintenance backlogs are tracked and routinely reported to maintenance management. Minimum and maximum goals are established and tracked. Performance indicators for planned versus actual costs, labor, and supervisor productivity, along with job delay codes, have improved planning and workforce utilization.

Weaknesses

A number of recent occurrences indicate some weaknesses in implementation of integrated safety management at the working level. Several recent subcontractor events demonstrate that subcontractor work control requires improvement. The events indicate a lack of understanding of and adherence to DOE and site requirements. Additionally, inadequate work controls were also identified in the nuclear material disposition project regarding criticality safety violations.

Although the penetration permitting process is improved, procedure and implementation deficiencies could place workers at risk. Procedural requirements and cautions associated with use of the 1-1/4 inch blind penetration allowance in floors, ceilings, and walls are not adequate. Deficiencies and inconsistencies were also noted in the completion of penetration permits.

Summary

The enhanced work planning initiatives and a dedicated Enhanced Work Planning Department have been instrumental in helping line organizations improve work planning and control processes at FEMP. There has been a significant reduction in fragmentation of work planning processes, and progress is expected to continue. Implementation of these work planning processes and work control do remain a concern, and continued management attention is necessary. There are a large number of subcontractors performing work activities on site, and the number of reportable events attributed to subcontractors indicates some weaknesses in subcontractor work control.

The Maintenance Department has made significant improvement in all areas since the 1996 Office of Oversight evaluation. Many program elements missing in 1996 have been recently put in place, and the maintenance backlog has been significantly reduced. Because of the newness of many elements of the maintenance program, effectiveness in implementation needs to be demonstrated.

2.4 Electrical Safety

Background

The 1996 Office of Oversight evaluation focused on electrical safety work activities within the maintenance and safe shutdown programs, with a particular emphasis on the maintenance and calibration of the main and unit substations. Weaknesses identified were the lack of compliance with electrical procedures (e.g., Safe Shutdown Energy Isolation Procedure) and the use of draft procedures, the deferment of maintenance and calibration of the substations beyond the vendor-recommended intervals, and discrepancies in the corrective action process, which is addressed in another section of this evaluation report. Walkdowns in 1996 identified no significant electric safety concerns.



Assessment

Procedures for Electrical Work

Since 1996, significant progress has been achieved in the resolution of identified procedural deficiencies. The use of improved electrical procedures was evident during this evaluation. Electrical safety procedures, such as the Safe Shutdown and Energy Isolation Procedure and substation maintenance and switching procedures, have been revised to correct the deficiencies identified in the safety management evaluation. Although electrical procedures have been revised and improved, some deficiencies remain, as evidenced in a faulty switching procedure that led to an unplanned outage in February 1997. Additional procedural clarity is needed to avoid misinterpretation by workers and inconsistencies with field implementation practices. For example, the Safe Shutdown Energy Isolation Procedure may not identify all the equipment requiring safe shutdown. A review of a dozen penetration permits identified a number of procedural deficiencies, including a wide disparity in completing and signing the “Utility/Hazards Expected” section of the permit (indicating a lack of clarity in the penetration permit procedure instructions). FDF’s self-assessments of both procedures in recent months identified and corrected deficiencies in these processes; however, additional improvements are needed.

Field implementation inconsistencies with the electrical procedures were also noted. For example, although the Safe Shutdown procedure requires the labeling of isolated pipe and duct runs, many such components in the shutdown Waste Water Treatment Facility were not labeled in accordance with the procedure. At the Main Substation, a posted, but outdated, energy isolation plan referenced a recorder that had been removed and replaced by a different type of recorder.

Electrical Substations

Since the 1996 electrical safety assessment, significant progress has been made on preventive maintenance at both the main and unit substations. Maintenance on the main substation was completed by a subcontractor prior to the end of 1996, and follow-up actions were identified and implemented. Preventive maintenance on 31 active unit substations was completed prior to October 1997, and there have been no unplanned site power outages since the improvements. Maintenance work instructions for both the main and unit substations were either revised or prepared, and a review of maintenance work instructions is now required every two years, at a minimum.

Improvements in the main and unit substations were evident in walkdowns of these facilities. Current maintenance work instruction procedures were posted, and with a few exceptions, preventive maintenance and calibration are being satisfactorily performed as required. Some material deficiencies were observed in the main station battery room.

Institutional Electrical Safety Programs

At FEMP, electrical safety has been integrated into work activities, although there is no clear incorporation of some elements of an electrical safety program as recommended in National Fire Protection Association (NFPA) 70, NFPA 70E, and the new DOE Handbook on Electrical Safety (DOE-HDBK-1092-98) into a sitewide FEMP electrical safety program. Roles and responsibilities of FDF divisional subject matter experts are not clearly defined with respect to the electrical safety program. There are no electrical safety specialists within the Safety and Health Department, nor is there a site electrical safety committee to provide institutional guidance on electrical safety issues. Also, line management lacks clear guidance on their responsibilities for elements of the electrical safety program as defined in site procedures. FDF is evaluating model electrical safety program elements, such as clear organizational roles and responsibilities for electrical safety, the value of an electrical safety committee, and the designation of an Authority Having Jurisdiction for resolving electrical code disputes.

Similarly, there are no clearly defined DOE/FEMP roles and responsibilities for electrical safety program oversight, although Facility Representatives and safety engineers review electrical safety work practices as an element of their job descriptions. Emphasis by DOE/FEMP on electrical safety was evident in recent assessments on site programs for lockout/tagout, maintenance, and the penetration permits.

Finally, there is no clear mechanism for adjudicating electrical code disputes among FDF divisions and electrical safety subject matter experts, establishing site electrical safety training requirements, providing interpretations of site procedures, defining the need for division-level procedures, incorporating changes in electrical safety standards and regulations, and ensuring consistent implementation of electrical safety requirements across divisions and subcontractors. Each of these issues, particularly those concerning electrical safety roles and responsibilities, is being evaluated by FDF in preparing an implementation plan for DOE Order 440.1A “Worker Protection Management for DOE Federal and Contractor Employees.” This task was initiated in June 1998.

Positive Attributes

Improvements in preventive maintenance on main and unit electrical substations have improved the reliability of the site's power distribution system. Since the implementation of preventive maintenance programs for the site substations, there have been no outages resulting from inadequately maintained and calibrated equipment.

DOE/FEMP has emphasized electrical safety during assessment activities. Facility Representatives routinely evaluate electrical safety during facility walkthroughs. During the past two years, DOE/FEMP has performed electrical safety-related assessments of the site lockout/tagout program, maintenance, and the penetration permitting process.

Some FDF departments (e.g., Safe Shutdown Department) have increased emphasis on electrical safety training. Electrical safety training is provided to workers and management through a variety of courses and required reading programs in safety and health plans, energy isolation plans, and penetration permits. The Safe Shutdown Department has provided additional emphasis on electrical safety by requiring project, management, supervisory, and safety personnel to attend a three-day electrical standards training course.

Weaknesses

Roles and responsibilities for DOE/FEMP and FDF with respect to electrical safety program requirements are not clearly defined. There is no definition of the roles, responsibilities, authority, or qualification of electrical subject matter experts or designation of an Authority Having Jurisdiction, as required by NFPA 70. Definition is also lacking for line management and divisions that support the electrical safety program.

Some elements of the electrical safety program recommended by NFPA 70, NFPA 70E, and the DOE Handbook on Electrical Safety are not adequately addressed. There is no clear mechanism for adjudicating electrical code disputes, interpreting requirements, defining the need for division procedures, establishing electrical safety training requirements, incorporating changes in electrical safety requirements, and ensuring consistent implementation of electrical safety requirements.

Summary

Significant progress has been achieved in resolving the electrical safety deficiencies identified during the 1996 Office of Oversight evaluation. Electrical safety

procedures have been revised to resolve deficiencies; however, some still lack clarity and are inconsistent with procedure implementation practices in the field. The most noticeable progress in electrical safety has been in the development and implementation of preventive maintenance, calibration, and switching procedures for the main and unit substations. However, continued vigilance in these areas must be maintained, as evidenced in the isolated deficiencies observed during walk-throughs of the main and unit substations.

Continued progress in electrical safety at FEMP is evidenced in the absence of electrical work-related injuries in recent years, and minimal electrical occurrences. DOE/FEMP routinely evaluates electrical safety work activities of FDF and FDF subcontractors. Electrical safety work activities have benefited from the enhanced work planning process, revised procedures and safety performance requirements, increased emphasis on safety briefings at a variety of levels, and greater employee involvement in work activities. However, roles and responsibilities for electrical program elements are not well defined, and some electrical safety program elements may benefit from being more consistent with the electrical safety recommendations of NFPA 70, NFPA 70E, and the DOE Handbook on Electrical Safety.



2.5 Occupational Radiation Protection

Background

The 1996 Office of Oversight evaluation of radiation protection at FEMP identified no significant problems in the overall program or implementation of requirements and concluded that the program was generally strong. The one weakness identified involved a lack of adequate oversight and attention to proper development and implementation of radiological as-low-as-reasonably-achievable (ALARA) programs.

Because of the importance of radiological protection to work activities on site and the recent changes in organizational structure of the health and safety functions, including radiation protection, it was considered important to follow up on the current status of the radiation protection and ALARA programs at FEMP.

Assessment

Institutional Radiation Protection Program

The FEMP radiation protection program is well documented and is structured around the DOE Radiological Control Manual and 10 CFR 835 requirements. Program policy has been clearly defined and communicated in employee training programs (general employee training, Radiation Worker I & II, etc.). The site radiological control manual and internal and external technical basis documents are comprehensive and commensurate with the range of radiological environments present at the site. Administrative exposure guidelines are utilized to keep workers' exposures within DOE regulatory limits, and it is FDF and DOE policy to maintain both external and internal exposures ALARA.

The radiation protection program professionals and support staff were found to be highly qualified. Many personnel have post-secondary education and/or advanced degrees in either health physics or related physical science or engineering. Five individuals are certified by the American Board of Health Physics, and others are pursuing professional certifications. Professional and support staff continue to pursue professional development and continuing education. As a result, FDF and DOE/FEMP staff have the technical competence and knowledge of radiological hazards needed to perform all required job functions. There continues to be a low rate of turnover in the professional staff, with a large percentage of radiation protection personnel having been on site five years or longer.

Installation of a HIS-20 access control system has greatly improved the site's ability to ensure that institutional radiation protection program requirements are satisfied before entry to radiological areas is allowed. The system is installed at all entrances to the controlled area and at some entrances to contamination areas where routine work is performed. When a worker "swipes" his/her badge, the system provides an automated check that the worker is up to date with all radiological work permit (RWP) requirements for entering the area, such as required training and bioassay sampling frequency. FDF intends to expand the use of this system to any area where installation is practical.

Radiation Protection Assessment Programs

Both FDF and DOE/FEMP provide routine inspections of the FDF radiation protection program, both at the program level and in the field. Any field performance deficiencies are noted in radiological deficiency reports, which are categorized as to severity of the problem and then entered into the site's non-conformance tracking system and/or the DOE non-compliance tracking system as appropriate. All deficiency reports and associated non-conformance tracking issues are closed through formal responses.

In addition to the field reviews and oversight inspections, a complete review of each institutional program element is conducted every two years, which is more frequent than the triennial requirement for programmatic reviews stated in 10 CFR 835. The FDF Radiological Compliance Group also tracks and trends a number of radiological performance measures, including individual and collective radiation dose, contamination events, deficiency reports, and other radiological parameters. Results of these analyses are routinely documented and shared with DOE/FEMP and FDF management. Performance measures associated with radiological control have shown a decline in radiological contamination events over the years and very low individual and collective dose to workers.

Identification of Radiological Hazards and Controls

Radiological engineering groups within each project organization are tasked with design review and preparation/review of RWPs for projects. Based on the hazards present, the RWP is used to define job-specific controls, such as personal protective equipment, radiological survey, and air sampling requirements. For the work packages reviewed, the job-specific hazards analyses were considered adequate. These packages, with some exceptions, also had appropriately defined controls.

RWPs may contain conditions that, if met, trigger additional radiological hazard evaluation before work begins. It was noted that some jobs, such as maintenance and repair of underground utilities, are performed under standing RWPs with identified conditions; however, formal documented Radiological Engineering review or signature, once a condition is met, is not required in all cases. As a result, there is only limited assurance that if a condition is met, a hazard analysis is conducted to assure that existing radiological controls are adequate. Similarly, there is no requirement, once a condition is met, to amend the work package or RWP to show this history or any special instructions for workers based on the

assessment by the Radiological Engineer. In some situations, a worker assigned to the job can be allowed to sign in on the general standing RWP without any additional job-specific briefing on hazards or controls.

A review of RWP forms indicated a number of problems that could lead to confusion and misinterpretation. Problems identified include the presence of blocks on the form that are no longer required to be used and are, therefore, inconsistently checked; different ways of filling out the forms across different projects; confusing notes; no indication of air sampling data when respiratory protection was required; missing radiological surveys; and general legibility problems. Some of these RWP problems have also been documented in recent DOE/FEMP assessments.

Performance of Radiological Work

The implementation of radiological controls and requirements during work activities was assessed through field walk-throughs and inspections of several radiological work evolutions being conducted across the site. Most of the radiological work reviewed during this assessment involved non-routine maintenance-type work and excavations. Scheduling constraints did not permit observation of “routine” work in the buildings, most of which requires respiratory protection and additional training. For the work evolutions reviewed, no significant discrepancies from radiological control and personnel protection requirements were noted. However, it was observed that conduct of radiological operations in the field and oversight of work by radiological control technicians lacked appropriate rigor and attention to detail.



Implementation weaknesses were not limited to a particular project or area but existed across the work reviewed, which included several excavations under different line management divisions. Deficiencies in radiological conduct of operations included boundary control violations, lack of survey documentation, procedural informality, radiological housekeeping, and related issues. While none of the identified items alone

would constitute a serious program breach, collectively—and considering the similar findings by both DOE/FEMP and FDF during recent field inspections—a weakness in radiological conduct of operations is evident.

Positive Attributes

Management and technical staff responsible for radiological control at FEMP are highly qualified and competent. Staff qualification and competence in the radiation protection area at FEMP are impressive. Both DOE and FDF personnel with radiological protection responsibilities at FEMP have a high level of education and experience.

Radiation protection program documentation is comprehensive in scope and establishes a strong technical basis. The FEMP radiation protection program is well documented and is structured around the DOE Radiological Control Manual and 10 CFR 835 requirements. The site’s manual and internal and external technical basis documents are comprehensive and commensurate with the range of radiological environments that could be encountered across the site.

The implementation of the electronic HIS-20 access control system has streamlined and improved the effectiveness of training and dosimetry. The system provides an automated check that a worker meets all RWP requirements for entering an area, such as training and bioassay sampling frequency.

Weaknesses

Conduct of radiological operations shows signs of inattention to detail and lack of rigor in implementation of requirements. Field inspections and observations reveal a number of deficiencies related to field radiological conduct of operations. A review of DOE and FDF inspection and deficiency reports also indicates performance deficiencies in this area.

Improvements are needed in the clarity and consistency of information provided in RWPs and work packages. There is no mechanism for ensuring that work packages with standing and conditional RWPs are updated to reflect job history, radiological reviews, special precautions, and other information that would be beneficial to workers and technicians in the field. Completed RWP forms are sometimes ambiguous and inconsistent, lack survey data, or are not completely legible.

Summary

The FEMP radiation protection program continues to maintain a strong and well documented technical basis. Staff qualifications, education, and training also continue to be strong. Staff turnover is low, and a large percentage of the technical and management staff have been at FEMP at least five years. Oversight is performed as required by 10 CFR 835, with both DOE and FDF conducting routine assessments of program

elements and field implementation. Weaknesses identified in 1996, associated with occupational and environmental ALARA programs, have been successfully strengthened through improved planning and procedural guidance and deployment of information campaigns. While the underlying program is solid, conduct of radiological operations in the field and the clarity and consistency of RWPs used to delineate radiological requirements were found to be in need of improvement.

Appendix A

Follow-up Review Team Membership, Composition, and Responsibilities

Deputy Assistant Secretary for Oversight

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Associate Deputy Assistant Secretary

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Neal Goldenberg - Technical Matters

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Bob Freeman, Technical Advisor